

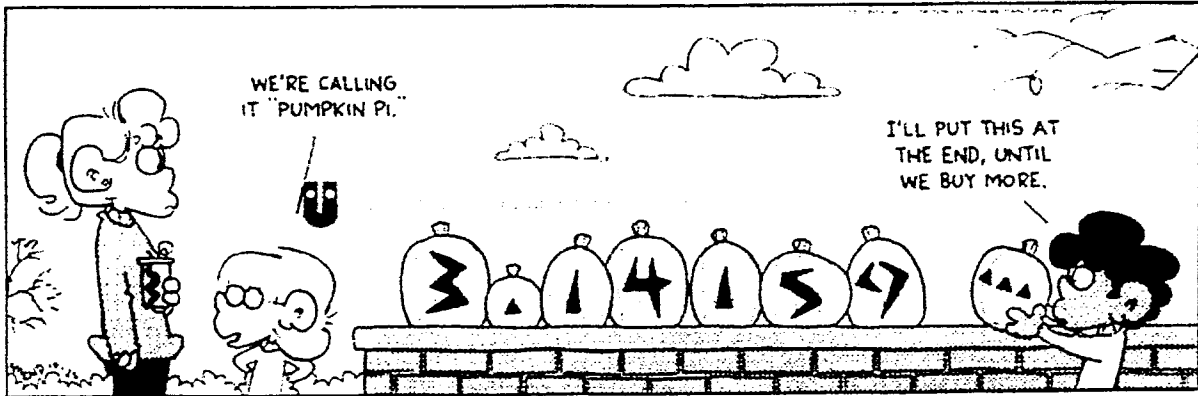
Radicals

Unit 1

Section	Topic	Book Assignments	Page Number in Packet
8.7	Radical Expressions/Perfect Squares		1,2,3
8.7	Simplifying Radical Expressions	Pg. 533 #14-28 ALL	4, 5, 6, 7
8.7	Multiply and Dividing Radical Expressions	Pg. 533 #29-34 ALL	8 -13
8.7	Multiplying and Dividing Radical Expressions and Rationalizing the Denominator	Pg. 534 #1-22 23-24 ALL	8-13
8.7	Adding and Subtracting Radical Expressions	Pg. 534 #1-15 20-21 ALL	14-16
		Review	17-18
		Test	

2.2 Exponents

188-25



Perfect Squares

$1^2 = 1$	$6^2 = 36$	$11^2 = 121$	$16^2 = 256$	$21^2 = 441$
$2^2 = 4$	$7^2 = 49$	$12^2 = 144$	$17^2 = 289$	$22^2 = 484$
$3^2 = 9$	$8^2 = 64$	$13^2 = 169$	$18^2 = 324$	$23^2 = 529$
$4^2 = 16$	$9^2 = 81$	$14^2 = 196$	$19^2 = 361$	$24^2 = 576$
$5^2 = 25$	$10^2 = 100$	$15^2 = 225$	$20^2 = 400$	$25^2 = 625$

POWERS

Cubes	4 th	5 th	6 th
$2^3=8$	$2^4=16$	$2^5=32$	$2^6=64$
$3^3=27$	$3^4=81$	$3^5=243$	$3^6=729$
$4^3=64$	$4^4=256$	$4^5=1024$	$4^6=4096$
$5^3=125$	$5^4=625$	$5^5=3125$	$5^6=15625$
$6^3=216$	$6^4=1296$	$6^5=7776$	$6^6=46656$
$7^3=343$	$7^4=2401$	$7^5=16807$	$7^6=117649$
$8^3=512$	$8^4=4096$	$8^5=32768$	$8^6=262144$
$9^3=729$	$9^4=6561$	$9^5=59049$	$9^6=531441$
$10^3=1000$	$10^4=10000$	$10^5=100000$	$10^6=1000000$

You can use prime factorization to determine any of these!!

Square Roots

Find each square root.

1) $\sqrt{64}$

2) $\sqrt{36}$

3) $\sqrt{49}$

4) $\sqrt{0}$

5) $\sqrt{25}$

6) $\sqrt{1}$

7) $\sqrt{9}$

8) $\sqrt{4}$

Find each square root. Round to the nearest whole number.

9) $-\sqrt{200}$

10) $\sqrt{144}$

11) $-\sqrt{80}$

12) $-\sqrt{34}$

13) $-\sqrt{127}$

14) $\sqrt{1}$

15) $-\sqrt{36}$

16) $-\sqrt{148}$

Find each square root.

17) $-\sqrt{\frac{1}{4}}$

18) $\sqrt{\frac{81}{121}}$

19) $\sqrt{\frac{49}{196}}$

20) $\sqrt{\frac{81}{49}}$

21) $-\sqrt{\frac{25}{196}}$

22) $-\sqrt{\frac{196}{225}}$

Why Does Mrs. Snuggle Call Her Sons' Ranch "SOLAR FOCUS"?



Simplify each expression below and find your answer in the corresponding set of answer boxes. Print the letter of that exercise in the box containing the answer.

- (S) $\sqrt{49}$
- (T) $\sqrt{1}$
- (H) $\sqrt{100}$
- (I) $\sqrt{900}$

- (S) $-\sqrt{64}$
- (E) $-\sqrt{225}$
- (I) $-\sqrt{10,000}$
- (T) $\sqrt{\frac{9}{16}}$

- (O) $\sqrt{9^2}$
- (E) $\sqrt{25} - \sqrt{16}$
- (T) $\sqrt{25} - 16$
- (H) $\sqrt{36} + 64$
- (P) $\sqrt{36} + \sqrt{64}$

30	1	-12	-100	7	1000	$\frac{3}{4}$	10	-15	$\frac{2}{3}$	-8	14	9	3	12	60	10	15	11	1
----	---	-----	------	---	------	---------------	----	-----	---------------	----	----	---	---	----	----	----	----	----	---

- (H) $\sqrt{10^2} - \sqrt{8^2}$
- (S) $\sqrt{10^2} - 8^2$
- (O) $\sqrt{10^2} - 6^2$
- (R) $\sqrt{13^2} - 12^2$

- (E) $\sqrt{400}$
- (T) $-\sqrt{8100}$
- (N) $-\sqrt{14,400}$
- (S) $\sqrt{\frac{1}{9}}$

- (E) $-\sqrt{\frac{81}{4}}$
- (A) $\sqrt{0.25}$
- (I) $-\sqrt{0.49}$
- (E) $\sqrt{0.01}$
- (A) $-\sqrt{1.44}$
- (T) $\sqrt{0.0004}$
- (S) $-\sqrt{0.0121}$
- (M) $(\sqrt{\frac{2}{3}})^2$

-90	2	20	-200	$\frac{1}{3}$	8	-120	6	14	5	-1.2	-0.7	-0.11	$-\frac{9}{2}$	-0.9	$\frac{2}{3}$	0.1	0.5	0.02
-----	---	----	------	---------------	---	------	---	----	---	------	------	-------	----------------	------	---------------	-----	-----	------

Simplifying Radicals

Simplify. Use absolute value signs when necessary.

1) $\sqrt{24}$

2) $\sqrt[3]{1000}$

3) $\sqrt[3]{-162}$

4) $\sqrt{512}$

5) $\sqrt[4]{128n^8}$

6) $\sqrt{98k}$

7) $\sqrt[5]{224r^7}$

8) $\sqrt[3]{24m^3}$

9) $\sqrt{392x^2}$

10) $\sqrt{512x^2}$

11) $\sqrt[4]{405x^3y^2}$

12) $\sqrt[3]{-16a^3b^8}$

13) $\sqrt[4]{128x^7y^7}$

14) $\sqrt[3]{16xy}$

15) $\sqrt[6]{448x^7y^7}$

16) $\sqrt[3]{56x^5y}$

Critical thinking questions:

17) What simplifies into $2mn^2\sqrt[3]{5mn^2}$?

18) Simplify $\sqrt[n]{3 \cdot 2^n \cdot x^{2n} y^{n+3}}$

Name _____ Date _____

2.2A SIMPLIFYING RADICAL EXPRESSIONS

Simplify each radical expression

1. $\sqrt{44} =$
2. $\sqrt[3]{54} =$
3. $\sqrt{63a^{11}} =$
4. $\sqrt[3]{72a^{19}} =$
5. $\sqrt{75a^9} =$
6. $\sqrt[3]{125a^{13}} =$
7. $\sqrt{48a^{19}b^{10}} =$
8. $\sqrt[3]{-216a^{23}b^{15}} =$
9. $\sqrt{72a^{17}b^5c^{12}} =$
10. $\sqrt[3]{64a^{11}b^9c^{27}} =$
11. $\sqrt{28a^{14}b^9c^{18}} =$
12. $\sqrt[3]{40a^{15}b^6c^{19}} =$
13. $\sqrt{\frac{121}{36}} =$
14. $\sqrt{\frac{108a^{13}}{6a^7}} =$
15. $\sqrt{\frac{60a^{12}b^9}{5a^7b^3}} =$
16. $\sqrt{\frac{64a^{17}b^{11}}{8a^9b^8}} =$
17. $\sqrt{\frac{168a^{19}b^{15}}{7a^{13}b^{12}}} =$
18. $\sqrt{\frac{243a^{11}b^{17}}{9a^6b^{13}}} =$

Name _____ Date _____

2.2B SIMPLIFYING RADICAL EXPRESSIONS

Simplify each radical expression

1. $\sqrt{72} =$
2. $\sqrt[3]{56} =$
3. $\sqrt{50a^{17}} =$
4. $\sqrt[3]{81a^7} =$
5. $\sqrt{80a^{19}} =$
6. $\sqrt[3]{-64a^{25}} =$
7. $\sqrt{90a^{12}b^{17}} =$
8. $\sqrt[3]{-125a^{28}b^{14}} =$
9. $\sqrt{40a^{11}b^8c^5} =$
10. $\sqrt[3]{216a^{16}b^{12}c^8} =$
11. $\sqrt{54a^{10}b^{15}c^6} =$
12. $\sqrt[3]{32a^5b^{14}c^{21}} =$
13. $\sqrt{\frac{144}{49}} =$
14. $\sqrt{\frac{108a^{15}}{9a^{12}}} =$
15. $\sqrt{\frac{40a^9b^{14}}{5a^5b^7}} =$
16. $\sqrt{\frac{84a^{12}b^9}{7a^3b^6}} =$
17. $\sqrt{\frac{72a^{16}b^{12}}{6a^4b^7}} =$
18. $\sqrt{\frac{90a^{16}b^{22}}{5a^9b^{17}}} =$

Quadratic Equations w/ Square Roots

Solve each equation by taking square roots.

1) $k^2 + 6 = 6$

2) $25v^2 = 1$

3) $n^2 + 4 = 40$

4) $x^2 - 2 = 17$

5) $9r^2 - 3 = -152$

6) $9r^2 - 5 = 607$

7) $-10 - 5n^2 = -330$

8) $5a^2 + 7 = -60$

9) $4b^2 + 2 = 326$

10) $-8 - 8p^2 = -31$

11) $5x^2 + 9 = 14$

12) $2x^2 - 2 = 6$

13) $8r^2 - 17 = 2471$

14) $13p^2 - 3 = 4209$

15) $7p^2 + 16 = 2151$

16) $13 - 8n^2 = -1139$

CLASS EXERCISES

Determine whether each statement is true or false. If a statement is false, correct it to make it true.

- The index in $\sqrt{3}$ is 3.
- The radicand in $\sqrt[5]{32}$ is $\sqrt[5]{32}$.
- The index in $\sqrt{5x^4}$ is 2.
- The radicand in $\sqrt[4]{x^8y^4}$ is x^8y^4 .
- $\sqrt[6]{-1}$ is a real number.
- $\sqrt[3]{10x^2}$ is a radical expression.
- $\sqrt[5]{0}$ is not a real number.
- $\sqrt[4]{-16x^8}$ is not a real number.

Predict the number of real solutions for each equation.

- $3x^2 + 10 = 8$
- $5x^3 - 6 = -6$
- $x^4 = 1$

PRACTICE EXERCISES

Find the real solutions, if any, for each equation.

- $x^2 = 100$
- $3x^2 = 75$
- $m^2 - 36 = 0$
- $m^2 - 4 = 12$
- $y^2 + 12 = 3$
- $5y^2 = -30$
- $4x^3 = 32$
- $x^4 + 81 = 0$
- $5x^3 + 16 = 16$
- $2x^2 - 50 = 0$
- $y^3 = -216$
- $2x^4 - 32 = 0$

Simplify each radical expression if it is a real number.

- $\sqrt{36}$
- $-\sqrt{36}$
- $\pm\sqrt{36}$
- $\sqrt{0.36}$
- $\sqrt{-1}$
- $\sqrt{100}$
- $-\sqrt{121}$
- $\sqrt{-81}$
- $\sqrt[3]{64}$
- $\sqrt[3]{-64}$
- $\sqrt{16x^2}$
- $\sqrt{0.25x^6}$
- $\sqrt{x^8y^{18}}$
- $\sqrt{x^{10}y^{100}}$
- $\sqrt{x^{80}y^{50}}$
- $\sqrt{64b^{48}}$
- $\sqrt{121a^{90}}$
- $-\sqrt{81c^{48}d^{64}}$
- $\sqrt{64x^{36}y^{96}}$
- $\sqrt[3]{-64a^{81}}$
- $\sqrt[5]{32y^{25}}$
- $\sqrt[3]{x^{14}y^{35}}$
- $\sqrt{0.0064x^{40}}$
- $-\sqrt[3]{0.000027y^{33}}$
- $\sqrt{(x+3)^2}$
- $\sqrt{(x+1)^4}$
- $\sqrt[3]{(x-5)^6}$
- $\sqrt[3]{(x-2)^9}$
- $\sqrt[3]{(x^2-8x+16)^9}$
- $-\sqrt[4]{(x^2+2x+1)^8}$
- $\pm\sqrt[11]{-m^{33}a}$
- $\sqrt{25p^{4c-2}}$
- $\sqrt[6]{64q^{12a+54}}$
- $\sqrt{x^{4a+16}}$
- $\sqrt[3]{s^{3n}}$
- $\sqrt[4]{r^n}$
- $\sqrt[4]{(p+q)^n}$

15) $-2\sqrt{15}(-3\sqrt{3} + 3\sqrt{5})$

Multiplying Radical Expressions

Simplify.

1) $3\sqrt{12} \cdot \sqrt{6}$

17) $\sqrt{14x}(3 - \sqrt{2x})$

3) $\sqrt{6} \cdot \sqrt{6}$

19) $\sqrt{3v}(\sqrt{6} + \sqrt{10})$

5) $-4\sqrt{15} \cdot -\sqrt{3}$

21) $(-2\sqrt{3} + 2)(\sqrt{3} - 5)$

7) $\sqrt{15n^2} \cdot \sqrt{10n^3}$

23) $(-2 - 3\sqrt{5})(5 - \sqrt{5})$

9) $-3\sqrt{7r^3} \cdot 6\sqrt{7r^2}$

25) $(5\sqrt{2x} + \sqrt{5})(-4\sqrt{2x} + \sqrt{5x})$

11) $\sqrt{3}(5 + \sqrt{3})$

27) $(5 + 4\sqrt{3})(3 + \sqrt{3})$

13) $-3\sqrt{3}(2 + \sqrt{6})$

Dividing Radical Expressions

Simplify.

$$\frac{\sqrt{15}}{5\sqrt{20}}$$

$$13) \frac{4x^3 - 3\sqrt{3x}}{3\sqrt{3x^2}}$$

$$3) \frac{\sqrt{6}}{\sqrt{27}}$$

$$15) \frac{3}{4 + 4\sqrt{5}}$$

$$5) \frac{4}{\sqrt{5}}$$

$$17) \frac{5}{-3 - 3\sqrt{3}}$$

$$\frac{\sqrt{5}}{\sqrt{3}}$$

$$19) \frac{2 + 5\sqrt{3}}{-4 + 4\sqrt{2}}$$

$$9) \frac{\sqrt{3x^2y^3}}{4\sqrt{5xy^3}}$$

$$21) \frac{\sqrt{5} + 3}{4 - \sqrt{5}}$$

$$11) \frac{3 - 3\sqrt{3a}}{4\sqrt{8a}}$$

PRACTICE EXERCISES

Simplify.

1. $\sqrt{3} \cdot \sqrt{3}$
2. $\sqrt{2} \cdot \sqrt{2}$
3. $\sqrt{11} \cdot \sqrt{11}$
4. $\sqrt{6} \cdot \sqrt{12}$
5. $\sqrt{5} \cdot \sqrt{40}$
6. $\sqrt[3]{3} \cdot \sqrt[3]{18}$
7. $\sqrt[3]{10y^3} \cdot \sqrt[3]{25y^3}$
8. $\sqrt{3x} \cdot \sqrt{3x}$
9. $\sqrt{7xy} \cdot \sqrt{7xy}$
10. $\sqrt{3x} \cdot \sqrt{5x}$
11. $3\sqrt{7x^3} \cdot 2\sqrt{21x^3y^2}$
12. $4\sqrt{2x} \cdot 5\sqrt{6xy^2}$
13. $4\sqrt[3]{5y^3} \cdot 2\sqrt[3]{50y^4}$
14. $-\sqrt[3]{2x^2y^2} \cdot 2\sqrt[3]{16x^5y}$
15. $\frac{\sqrt{500}}{\sqrt{5}}$
16. $\frac{\sqrt{32}}{\sqrt{2}}$
17. $\frac{\sqrt{96}}{\sqrt{8}}$
18. $\frac{\sqrt{48x^3y^4}}{\sqrt{3xy^2}}$
19. $\frac{\sqrt{56x^5y^5}}{\sqrt{7xy}}$
20. $\frac{\sqrt{36x^3}}{\sqrt{12x}}$
21. $\frac{\sqrt{x}}{\sqrt{2}}$
22. $\frac{\sqrt{5}}{\sqrt{8x}}$
23. $\frac{\sqrt{2}}{\sqrt{5}}$
24. $\frac{\sqrt{3x}}{\sqrt{6}}$
25. $3(\sqrt{2} - 3\sqrt{5})$
26. $-2(\sqrt[3]{6} + \sqrt[3]{2})$
27. $\frac{1 + \sqrt{2}}{\sqrt{2}}$
28. $\frac{3 + \sqrt{5}}{\sqrt{5}}$
29. $\frac{2 - \sqrt{7}}{\sqrt{7}}$
30. $\frac{\sqrt{3} - \sqrt{2}}{\sqrt{8}}$
31. $\sqrt{8y^5} \cdot \sqrt{40y^2}$
32. $\sqrt{7x^5} \cdot \sqrt{42xy^9}$
33. $\sqrt[3]{6} \cdot \sqrt[3]{16}$
34. $\sqrt[3]{4} \cdot \sqrt[3]{80}$
35. $\sqrt{x^5y^5} \cdot 3\sqrt{2x^7y^6}$
36. $5\sqrt{2xy^6} \cdot 2\sqrt{2x^3y}$
37. $\sqrt{2}(\sqrt{50} + 7)$
38. $\sqrt{3}(5 + \sqrt{21})$
39. $\sqrt{5}(\sqrt{5} + \sqrt{15})$
40. $\sqrt{8}(\sqrt{24} + 3\sqrt{8})$
41. $\sqrt[3]{2x} \cdot \sqrt[3]{4} \cdot \sqrt[3]{2x^2}$
42. $\sqrt[3]{3x^2} \cdot \sqrt[3]{x^2} \cdot \sqrt[3]{9x^3}$
43. $\frac{15\sqrt{60x^5}}{3\sqrt{12x}}$
44. $\frac{\sqrt{3xy^2}}{\sqrt{5xy^3}}$
45. $\frac{\sqrt{5x^4y}}{\sqrt{2x^2y^3}}$
46. $\frac{5\sqrt{2}}{3\sqrt{7x}}$
47. $\frac{-6\sqrt{7}}{-5\sqrt{3y^3}}$
48. $\frac{4\sqrt{2xy}}{9\sqrt{5x^2y}}$
49. $\frac{1}{\sqrt[3]{9x}}$
50. $\frac{10}{\sqrt[3]{5x^2}}$
51. $\frac{\sqrt[3]{14}}{\sqrt[3]{7x^2y}}$
52. $\frac{3\sqrt{11x^3y}}{-2\sqrt{12x^4y}}$
53. $\frac{4 + \sqrt{5}}{\sqrt{72}}$
54. $\frac{7 + \sqrt{6}}{\sqrt{84}}$
55. $\frac{(\sqrt{4x})^2(\sqrt[3]{3x})^3}{\sqrt{5}}$
56. $\frac{(\sqrt[3]{7x^3y})^3(x)^2}{\sqrt{32x}}$
57. $\sqrt{\sqrt{16x^4y^4}}$
58. $\sqrt[3]{\sqrt{64x^6y^{12}}}$
59. $\sqrt{(\sqrt[4]{16x^8y^{20}})^2}$
60. $\sqrt{\sqrt[3]{8000}}$

Name _____ Date _____

MULTIPLYING AND DIVIDING RADICALS

Simplify

1.	$\sqrt{63a^{17}} =$
2.	$\sqrt{52a^9b^{12}} =$
3.	$\sqrt[3]{56a^{11}b^5} =$
4.	$\sqrt{6a^7b^9} \cdot \sqrt{8a^4b^5} =$
5.	$\sqrt[3]{16a^8b^5} \cdot \sqrt[3]{4a^{11}b^7} =$
6.	$-3\sqrt{6x^8y^3} \cdot 2\sqrt{8x^5y^7} =$
7.	$4\sqrt[3]{8x^{11}y^{16}} \cdot 2\sqrt[3]{7x^7y^9} =$
8.	$\frac{\sqrt{72x^{18}y^{13}}}{\sqrt{4x^{11}y^9}} =$
9.	$\frac{\sqrt[3]{144x^{19}y^{11}}}{\sqrt[3]{6x^{12}y^7}} =$
10.	$\frac{\sqrt{32a^5b^{11}}}{\sqrt{18a^9b^8}} =$
11.	$\frac{\sqrt[3]{24a^{14}b^7}}{\sqrt[3]{30a^6b^{15}}} =$
12.	$8(4\sqrt{6} - 2\sqrt{8}) =$
13.	$\frac{5\sqrt{2} + 3\sqrt{6}}{4\sqrt{3}} =$
14.	$\frac{6\sqrt{3} - 4\sqrt{6}}{4\sqrt{2}} =$

Name _____ Date _____

MULTIPLYING AND DIVIDING RADICALS

Simplify

1. $\sqrt{90a^{17}} =$

2. $\sqrt{28a^{14}b^{11}} =$

3. $\sqrt[3]{72a^{19}b^6} =$

4. $\sqrt{8a^7b^3} \cdot \sqrt{5a^4b^5} =$

5. $\sqrt[3]{16a^9b^{13}} \cdot \sqrt[3]{5a^3b^6} =$

6. $2\sqrt{12x^8y^{11}} \cdot 4\sqrt{6x^7y} =$

7. $3\sqrt[3]{9x^3y^{11}} \cdot 4\sqrt[3]{18x^7y^3} =$

8. $\frac{\sqrt{108x^{17}y^{13}}}{\sqrt{6x^{10}y^5}} =$

9. $\frac{\sqrt[3]{144x^9y^{17}}}{\sqrt[3]{9x^7y^{12}}} =$

10. $\frac{\sqrt{54a^{17}b^8}}{\sqrt{36a^{10}b^{14}}} =$

11. $\frac{\sqrt[3]{30a^{13}b^7}}{\sqrt[3]{48a^7b^{18}}} =$

12. $6\sqrt{2}(3\sqrt{5} + 7\sqrt{3}) =$

13. $\frac{9\sqrt{3} - 4\sqrt{6}}{7\sqrt{2}} =$

14. $\frac{8\sqrt{6} + 4\sqrt{2}}{3\sqrt{3}} =$

Name _____ Date _____

REVIEW ON SECTIONS 2.1 - 2.3

Simplify each radical expression, if it is a real number.

1. $\sqrt{-144} =$	2. $\pm\sqrt{49} =$	3. $\sqrt[3]{-125} =$
4. $\sqrt[3]{64} =$	5. $-\sqrt{36} =$	6. $\sqrt{81a^{14}} =$
7. $\sqrt[3]{27a^{24}} =$	8. $\sqrt{16a^{12}b^6} =$	9. $\sqrt[3]{-216a^{15}b^{27}} =$
10. $\sqrt{196a^{10}b^{16}} =$	11. $\sqrt{(4x+7)^{20}} =$	12. $\sqrt[3]{(8x-3)^{12}} =$

Simplify each radical expression

13. $\sqrt{72a^{17}b^{11}} =$
14. $\sqrt{16a^7b^4} \cdot \sqrt{5a^9b^3} =$
15. $6(4\sqrt{3} + 3\sqrt{2}) =$
16. $\sqrt{\frac{216a^{17}}{12a^6}} =$
17. $\sqrt[3]{48a^{19}} =$
18. $\sqrt{80a^{11}} =$
19. $4\sqrt{3} \cdot 2\sqrt{8} =$
20. $\sqrt[3]{-108a^{14}b^{22}} =$
21. $\sqrt{54a^{12}b^{17}} =$

$$22. 4\sqrt{3a^7} \cdot 3\sqrt{6a^9} =$$

$$23. \sqrt{\frac{96a^{12}b^{24}}{8a^5b^{11}}} =$$

$$24. \sqrt{45} =$$

$$25. -6\sqrt{10a^8} \cdot 2\sqrt{5a^6} =$$

$$26. \sqrt[3]{16a^{11}} \cdot \sqrt[3]{12a^9} =$$

$$27. \sqrt{\frac{243a^{19}}{9a^6}} =$$

$$28. \sqrt{125a^{13}b^{17}c^{22}} =$$

$$29. \sqrt{9x} \cdot \sqrt{9x} =$$

$$30. -4(7\sqrt{6} - 5\sqrt{2}) =$$

$$31. \sqrt[3]{128a^{26}b^{13}} =$$

$$32. \sqrt{63a^{12}b^{19}} =$$

Adding and Subtracting Radical Expressions

Date _____ Period _____

Simplify.

1) $3\sqrt{6} - 4\sqrt{6}$

2) $-3\sqrt{7} + 4\sqrt{7}$

3) $-11\sqrt{21} - 11\sqrt{21}$

4) $-9\sqrt{15} + 10\sqrt{15}$

5) $-10\sqrt{7} + 12\sqrt{7}$

6) $-3\sqrt{17} - 4\sqrt{17}$

7) $-10\sqrt{11} - 11\sqrt{11}$

8) $-2\sqrt{3} + 3\sqrt{27}$

9) $2\sqrt{6} - 2\sqrt{24}$

10) $2\sqrt{6} + 3\sqrt{54}$

11) $-\sqrt{12} + 3\sqrt{3}$

12) $3\sqrt{3} - \sqrt{27}$

$$13) 3\sqrt{8} + 3\sqrt{2}$$

$$14) -3\sqrt{6} + 3\sqrt{6}$$

$$15) -3\sqrt{20} - \sqrt{5}$$

$$16) 2\sqrt{45} - 2\sqrt{5}$$

$$17) 3\sqrt{18} - 2\sqrt{2}$$

$$18) -3\sqrt{18} + 3\sqrt{8} - \sqrt{24}$$

$$19) 3\sqrt{18} + 3\sqrt{12} + 2\sqrt{27}$$

$$20) -3\sqrt{5} - \sqrt{6} - \sqrt{5}$$

$$21) -3\sqrt{2} + 3\sqrt{20} - 3\sqrt{8}$$

$$22) -3\sqrt{3} - \sqrt{8} - 3\sqrt{3}$$

$$23) -2\sqrt{20} + 2\sqrt{18} - 2\sqrt{5}$$

$$24) 2\sqrt{18} - 2\sqrt{12} + 2\sqrt{18}$$

$$25) -\sqrt{45} + 2\sqrt{5} - \sqrt{20} - 2\sqrt{6}$$

$$26) 2\sqrt{20} - \sqrt{20} + 3\sqrt{20} - 2\sqrt{45}$$

$$27) -3\sqrt{45} + 2\sqrt{12} + 3\sqrt{6} - 3\sqrt{20}$$

$$28) -\sqrt{27} - 3\sqrt{45} - \sqrt{20} + 2\sqrt{45}$$

PRACTICE EXERCISES



Use technology where appropriate.

Simplify.

1. $2\sqrt{7} + 3\sqrt{7}$
2. $7\sqrt[4]{5} - 2\sqrt[4]{5}$
3. $4\sqrt{2} + 5\sqrt{2}$
4. $6\sqrt[3]{3} - 2\sqrt[3]{3}$
5. $\sqrt{32} + \sqrt{8}$
6. $\sqrt{7x} - \sqrt{28x}$
7. $6\sqrt{18} + 3\sqrt{50}$
8. $14\sqrt{20} - 3\sqrt{125}$
9. $\sqrt{18} + \sqrt{32}$
10. $\sqrt{27} + \sqrt{48}$
11. $3\sqrt{18} + 2\sqrt{72}$
12. $8\sqrt{45} - 3\sqrt{80}$
13. $\sqrt[3]{54} + \sqrt[3]{16}$
14. $3\sqrt[3]{81} - 2\sqrt[3]{54}$
15. $\sqrt[4]{32} + \sqrt[4]{48}$
16. $(3 + \sqrt{5})(1 + \sqrt{5})$
17. $(2 + \sqrt{7})(1 + 3\sqrt{7})$
18. $(3 - 4\sqrt{2})(5 - 6\sqrt{2})$
19. $(\sqrt{5} - 1)(\sqrt{5} + 4)$
20. $(\sqrt{3} - \sqrt{7})(\sqrt{3} + 2\sqrt{7})$
21. $(2\sqrt{5} + 3\sqrt{2})(5\sqrt{5} - 7\sqrt{2})$
22. $(\sqrt{3} + \sqrt{5})^2$
23. $(\sqrt{8} - \sqrt{7})^2$
24. $(5 - \sqrt{11})^2$
25. $(\sqrt{13} + 6)^2$
26. $(5\sqrt{3} - 2)^2$
27. $(2\sqrt{5} + 3\sqrt{2})^2$
28. $(5 - \sqrt{11})(5 + \sqrt{11})$
29. $(4 - 2\sqrt{3})(4 + 2\sqrt{3})$
30. $(\sqrt{3} + \sqrt{5})(\sqrt{3} - \sqrt{5})$
31. $\frac{4}{1 + \sqrt{3}}$
32. $\frac{5}{1 - \sqrt{2}}$
33. $\frac{5 + \sqrt{3}}{2 - \sqrt{3}}$
34. $\frac{4 + \sqrt{5}}{2 + \sqrt{5}}$
35. $\sqrt{72} + \sqrt{32} + \sqrt{18}$
36. $\sqrt{75} + 2\sqrt{48} - 5\sqrt{3}$
37. $5\sqrt{32x} + 4\sqrt{98x}$
38. $4\sqrt{216y^2} + 3\sqrt{54y^2}$
39. $(3\sqrt{5} + 2\sqrt{10})(2\sqrt{5} + \sqrt{10})$
40. $(5\sqrt{6} - 3\sqrt{8})(3\sqrt{6} - 2\sqrt{8})$
41. $(1 + \sqrt{72})(5 + \sqrt{2})$
42. $(2 - \sqrt{98})(3 + \sqrt{18})$
43. $(\sqrt{x} + \sqrt{3})(\sqrt{x} + 2\sqrt{3})$
44. $(2\sqrt{y} - 3\sqrt{2})(4\sqrt{y} - 5\sqrt{2})$
45. $\frac{4}{3\sqrt{3} - 2}$
46. $\frac{5}{4\sqrt{7} + 5}$
47. $\frac{6 + \sqrt{15}}{4 - \sqrt{15}}$
48. $\frac{4\sqrt{18} - 2}{3 - \sqrt{18}}$
49. $\frac{3 + \sqrt{8}}{2 - 2\sqrt{8}}$
50. $\frac{4 + \sqrt{27}}{2 - 3\sqrt{27}}$
51. $\frac{4 + \sqrt{6}}{\sqrt{2} + \sqrt{3}}$
52. $\frac{5 - \sqrt{21}}{\sqrt{3} - \sqrt{7}}$
53. $\frac{2 + \sqrt{10}}{\sqrt{2} - 3\sqrt{5}}$
54. $\frac{3 + \sqrt{12}}{\sqrt{6} - 4\sqrt{2}}$
55. $\frac{-2 + \sqrt{8}}{-3 - \sqrt{2}}$
56. $\frac{-6 - \sqrt{27}}{-4 + \sqrt{3}}$
57. $\sqrt{\frac{x}{12}} + \sqrt{\frac{16x}{3}} - 3\sqrt{\frac{x}{27}}$
58. $\sqrt{12y} - \sqrt{\frac{y}{3}} + \frac{3\sqrt{y}}{\sqrt{27}}$
59. $\left(\frac{3 - 5\sqrt{2}}{3}\right)\left(\frac{3 + 5\sqrt{2}}{3}\right)$
60. $\left(\frac{7 + 8\sqrt{11}}{5}\right)\left(\frac{7 - 8\sqrt{11}}{5}\right)$
61. $\frac{a}{\sqrt{a-1}} - \sqrt{a-1}$
62. $\frac{3b}{\sqrt{b+1}} + \sqrt{b+1}$
63. $\frac{3 + \sqrt[3]{2}}{\sqrt[3]{2}}$
64. $\frac{5 + \sqrt[4]{x}}{\sqrt[4]{x}}$

Name _____ Date _____

ADDING AND SUBTRACTING RADICALS

Simplify each radical expression

1. $12\sqrt{3} - 7\sqrt{3} + 4\sqrt{3} =$

2. $5\sqrt[3]{6} - 2\sqrt[3]{6} - 17\sqrt[3]{6} =$

3. $3\sqrt{75} + 4\sqrt{27} - 7\sqrt{48} =$

4. $5\sqrt[3]{16} + 9\sqrt[3]{2} - 4\sqrt[3]{54} =$

5. $7\sqrt{45} - 8\sqrt{20} - 3\sqrt{80} =$

Simplify each radical expression

6. $(7 + \sqrt{6})(3 + \sqrt{6})$

7. $(9 - \sqrt{5})(9 + \sqrt{5})$

8. $(8 + 7\sqrt{3})(5 - 4\sqrt{3})$

9. $(6 - 5\sqrt{2})(6 + 5\sqrt{2})$

Simplify each radical expression

10. $\frac{8 + \sqrt{3}}{5 - \sqrt{3}} =$

11. $\frac{3 - 7\sqrt{2}}{8 + 4\sqrt{2}} =$

12. $\frac{7 + 4\sqrt{6}}{4 + 5\sqrt{6}} =$

13) $\frac{\sqrt{3}}{7-\sqrt{2}} =$	14) $(\sqrt{7}-2)^2 =$	15) $\frac{3+\sqrt{5}}{4-\sqrt{5}} =$
-------------------------------------	------------------------	---------------------------------------

III. Add or subtract the radicals.

16) $8\sqrt{3} - \sqrt{3} + -5\sqrt{3} =$	17) $5\sqrt{18} - 3\sqrt{32} + 6\sqrt{2} =$	18) $3\sqrt{27x} - 5\sqrt{48x} =$
19) $\sqrt[3]{125} - 2\sqrt{64} + \sqrt[4]{16} =$	20) $\frac{4\sqrt{3}}{5} - \frac{7\sqrt{3}}{4} =$	

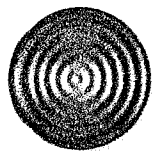


WHY ISN'T A SNOWMAN VERY SMART?

Simplify the expression. For each set of exercises, there is one extra answer. Write the letter of this answer in each box that contains the number of that exercise set.

6 3 6 2 10 10 8 1 4 7 9 2 5 8 10

1	<p>a. $n^2 \cdot n^3$</p> <p>b. $n^7 \cdot n^4$</p> <p>c. $2n^5 \cdot 5n$</p> <p>d. $10n^3 \cdot n^8$</p>	<p>Answers</p> <p>(C) $10n^6$</p> <p>(T) n^5</p> <p>(E) $10n^{11}$</p> <p>(O) $10n^8$</p> <p>(J) n^{11}</p>	6	<p>a. $\frac{m^8}{m^3}$</p> <p>b. $\frac{m^3}{m^8}$</p> <p>c. $\frac{40m^{11}}{8m^4}$</p> <p>d. $\frac{8m^4}{40m^{11}}$</p>	<p>Answers</p> <p>(G) $\frac{1}{m^5}$</p> <p>(B) $\frac{1}{5m^7}$</p> <p>(H) $5m^{15}$</p> <p>(T) m^5</p> <p>(M) $5m^7$</p>
2	<p>a. $(y^3)^2$</p> <p>b. $(y^5)^2$</p> <p>c. $(7y^2)^2$</p> <p>d. $(5y^4)^3$</p>	<p>Answers</p> <p>(B) $125y^{12}$</p> <p>(A) $15y^8$</p> <p>(R) y^{10}</p> <p>(U) $49y^4$</p> <p>(L) y^6</p>	7	<p>a. $t^6 \cdot t^5$</p> <p>b. $t^6 + t^5$</p> <p>c. $3t \cdot 8t^3$</p> <p>d. $3t + 8t^3$</p>	<p>Answers</p> <p>(K) $24t^4$</p> <p>(L) t^{11}</p> <p>(N) $3t + 8t^3$</p> <p>(B) $11t^8$</p> <p>(C) $t^6 + t^5$</p>
3	<p>a. $\frac{v^5}{v^2}$</p> <p>b. $\frac{v^9}{v^4}$</p> <p>c. $\frac{20v^8}{5v}$</p> <p>d. $\frac{44v^7}{11v^6}$</p>	<p>Answers</p> <p>(H) $4v$</p> <p>(N) v^5</p> <p>(I) v^3</p> <p>(T) $4v^7$</p> <p>(E) $4v^5$</p>	8	<p>a. $(15k)^2$</p> <p>b. $15k + 15k$</p> <p>c. $(2k^6)^5$</p> <p>d. $(2k^5)^6$</p>	<p>Answers</p> <p>(L) $30k$</p> <p>(D) $225k^2$</p> <p>(N) $30k^{30}$</p> <p>(R) $32k^{30}$</p> <p>(G) $64k^{30}$</p>
4	<p>a. $2a^3 \cdot 5a^3$</p> <p>b. $2a^3 + 5a^3$</p> <p>c. $9a^8 \cdot 4a^8$</p> <p>d. $9a^8 + 4a^8$</p>	<p>Answers</p> <p>(L) $10a^6$</p> <p>(N) $36a^{16}$</p> <p>(W) $13a^{16}$</p> <p>(D) $7a^3$</p> <p>(R) $13a^8$</p>	9	<p>a. $\frac{49x^7}{7x^2}$</p> <p>b. $\frac{49x^2}{7x^7}$</p> <p>c. $\frac{7x^7}{49x^2}$</p> <p>d. $\frac{7x^2}{49x^7}$</p>	<p>Answers</p> <p>(M) $\frac{x^5}{7}$</p> <p>(Y) $\frac{7}{x^5}$</p> <p>(U) $\frac{1}{7x^5}$</p> <p>(R) $7x$</p> <p>(L) $7x^5$</p>
5	<p>a. $(4q)^3$</p> <p>b. $4q + 4q + 4q$</p> <p>c. $(q^3)^4$</p> <p>d. $q^3 + q^3 + q^3 + q^3$</p>	<p>Answers</p> <p>(T) $12q$</p> <p>(I) $4q^{12}$</p> <p>(R) $64q^3$</p> <p>(P) $4q^3$</p> <p>(F) q^{12}</p>	10	<p>a. $(-w^3)^2$</p> <p>b. $(-w^3)^3$</p> <p>c. $(-w^3)^4$</p> <p>d. $(-w^3)^5$</p>	<p>Answers</p> <p>(T) w^6</p> <p>(F) w^{12}</p> <p>(D) $-w^{15}$</p> <p>(P) $-w^9$</p> <p>(S) $-w^{12}$</p>



Practice Masters Level A

2.2 Properties of Exponents

Evaluate each expression.

1. 5^{-2} _____

2. $(4 \cdot 3)^2$ _____

3. 14^0 _____

4. $\left(\frac{1}{3}\right)^{-2}$ _____

5. $\left(\frac{3}{4}\right)^3$ _____

6. $\left(\frac{1}{4}\right)^{-4}$ _____

7. $27^{\frac{1}{3}}$ _____

8. $64^{\frac{2}{3}}$ _____

9. $25^{\frac{5}{2}}$ _____

10. $81^{\frac{1}{2}}$ _____

11. $100^{\frac{-1}{2}}$ _____

12. $32^{\frac{-1}{5}}$ _____

13. $-2(2 \cdot 5^2)^2$ _____

14. $(3^2 \cdot 2^4)^0$ _____

Simplify each expression, assuming that no variable equals zero.

Write your answer with positive exponents.

15. $m^5 m^{-4}$ _____

16. $(x^3)^5$ _____

17. $x^6 x^{-10}$ _____

18. $(x^{-2})^3$ _____

19. $(r^{-3})^{-1}$ _____

20. $p^1 p^{-5}$ _____

21. $\frac{w^{15}}{w^3}$ _____

22. $\frac{w^{-4}}{w^{-2}}$ _____

23. $\left(\frac{2w^2}{w^{-6}}\right)$ _____

24. $\left(\frac{4x^{-2}}{x^3}\right)^{-3}$ _____

25. $(xy^2)(xy^4)$ _____

26. $(-t^3)(-t^4)(-t^2)$ _____

27. $(4xy)^2(-x^2y)^5$ _____

28. $(-2a^2b^3)^2(-3a^3b^4)^3$ _____

29. $\frac{x^{-10}}{2x^{-5}}$ _____

30. $(-y^3)\left(-\frac{y^6}{y^{-2}}\right)$ _____

Properties of Exponents

Date _____ Period _____

Simplify. Your answer should contain only positive exponents.

1) $2m^2 \cdot 2m^3$

2) $m^4 \cdot 2m^{-3}$

3) $4r^{-3} \cdot 2r^2$

4) $4n^4 \cdot 2n^{-3}$

5) $2k^4 \cdot 4k$

6) $2x^3y^{-3} \cdot 2x^{-1}y^3$

7) $2y^2 \cdot 3x$

8) $4v^3 \cdot vu^2$

9) $4a^3b^2 \cdot 3a^{-4}b^{-3}$

10) $x^2y^{-4} \cdot x^3y^2$

11) $(x^2)^0$

12) $(2x^2)^{-4}$

13) $(4r^0)^4$

14) $(4a^3)^2$

15) $(3k^4)^4$

16) $(4xy)^{-1}$

$$17) (2b^4)^{-1}$$

$$18) (x^2y^{-1})^2$$

$$19) (2x^4y^{-3})^{-1}$$

$$20) (3m)^{-2}$$

$$21) \frac{r^2}{2r^3}$$

$$22) \frac{x^{-1}}{4x^4}$$

$$23) \frac{3n^4}{3n^3}$$

$$24) \frac{m^4}{2m^4}$$

$$25) \frac{3m^{-4}}{m^3}$$

$$26) \frac{2x^4y^{-4}z^{-3}}{3x^2y^{-3}z^4}$$

$$27) \frac{4x^0y^{-2}z^3}{4x}$$

$$28) \frac{2h^3j^{-3}k^4}{3jk}$$

$$29) \frac{4m^4n^3p^3}{3m^2n^2p^4}$$

$$30) \frac{3x^3y^{-1}z^{-1}}{x^{-4}y^0z^0}$$

Simplifying Rational Exponents

Simplify.

1) $(n^4)^{\frac{3}{2}}$

2) $(27p^6)^{\frac{5}{3}}$

3) $(25b^6)^{-1.5}$

4) $(64m^4)^{\frac{3}{2}}$

5) $(a^8)^{\frac{3}{2}}$

6) $(9r^4)^{0.5}$

7) $(81x^{12})^{1.25}$

8) $(216r^9)^{\frac{1}{3}}$

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

9) $2m^2 \cdot 4m^{\frac{3}{2}} \cdot 4m^{-2}$

10) $3b^{\frac{1}{2}} \cdot b^{\frac{4}{3}}$

11) $\left(p^{\frac{3}{2}}\right)^{-2}$

12) $\left(a^{\frac{1}{2}}\right)^{\frac{3}{2}}$

Review of Algebraic and Numeric Expressions

Date _____ Period _____

Evaluate each expression.

1) $(7 - 2) \div 5$

2) $(3 + 3)^2$

3) $(6 - 3)^2$

4) $5 + (16 \div 2) \div 3$

5) $(-6 \times 2) \div -3$

6) $2 + 12 \div 2 + 1$

7) $-4 - (1 - 5) - (-4)^2$

8) $-3 \times 2 \times 2(-3 - 1)$

9) $(4 - 3)(1 - (3 + 5)) \times 5$

10) $((-16 - (-2 + 1)) \times 2) \div 5$

11) $2 - 8 \div -2 - 3 - -12 \div -6 \times -2$

12) $(-11 - 6 - -5 + 1 + 3 \times 2) \div -5$

Evaluate each using the values given.

13) $y + z + 2$; use $y = -6$, and $z = 5$

14) $p(q \div 3 - p)$; use $p = -6$, and $q = -3$

Worksheet #8—Basic Arithmetic Fractional Exponent Problems

E. White

Fall 2004

Simplify each of the following. Leave no exponents in your final answer.

(1) 9^{-2}

(2) $8^{2/3}$

(3) $32^{2/5}$

(4) $27^{-1/3}$

(5) $\left(\frac{1}{2}\right)^{-2}$

(6) $(-32)^{-3/5}$

(7) $16^{1/2}$

(8) $\left(\frac{4}{81}\right)^{3/2}$

(9) $\left(\frac{2}{3}\right)^2$

(10) $\left(\frac{4}{9}\right)^{-2}$

(11) $(-8)^{2/3}$

(12) $\left(\frac{1}{64}\right)^{-2/3}$

(13) 5^0

(14) $16^{-3/4}$

(15) 4^{-2}

(16) 1^{-2}

(17) $-\left(\frac{1}{8}\right)^{-1}$

(18) $\left(-\left(\frac{1}{8}\right)\right)^{-1}$

(19) $\left(-\left(\frac{1}{8}\right)\right)^{-2}$

(20) $\left(\frac{9}{16}\right)^{1/2}$

(21) $\left(\frac{8}{27}\right)^{-2/3}$

(22) $4^{-5/2}$

(23) $144^{1/2}$

(24) $27^{1/3}$

(25) 8^{-2}

(26) $4^{-3/2}$

(27) $25^{3/2}$

(28) $64^{1/6}$

(29) $100^{-1/2}$

(30) $64^{1/3}$

(31) $16^{1/4}$

(32) $8^{2/3}$

(33) $4^{-1/2}$

(34) $64^{2/3}$

(35) $\left(\frac{1}{9}\right)^{-3/2}$

(36) $4^{1/2} + 9^{-1/2}$

(37) $\left(\frac{1}{2}\right)^3$

(38) $(-8)^{-1/3}$

(39) $\left(\frac{4}{9}\right)^{3/2}$

(40) $\left(\frac{2}{3}\right)^{-2}$

(41) $\left(\frac{1}{4}\right)^{1/2}$

(42) $27^{-1/3}$

(43) $(-9)^{-1}$

(44) $64^{3/2}$

(45) $32^{1/5}$

(46) $(-8)^{-3}$

(47) $3^{-1}5^{-2}$

(48) $64^{1/3}$

(49) $125^{-2/3}$

(50) $36^{-3/2}$

(51) $32^{-2/5}$

(52) $64^{-1/2}$

(53) $4^{1/2}8^{1/3}$

(54) $\left(\frac{2}{5}\right)^0$

$$(55) \ 8^{2/6}$$

$$(58) \ (4^{1/3})^{3/2}$$

$$(61) \ 3\left(\frac{4}{9}\right)^{-3/2}$$

$$(64) \ \left(\frac{64}{9}\right)^{3/2}$$

$$(67) \ 5^{3/4} 5^{1/4}$$

$$(70) \ \left(-\left(\frac{4}{9}\right)\right)^{-2}$$

$$(73) \ \left(\frac{1}{64}\right)^{-2/3}$$

$$(76) \ \left(\frac{2}{3}\right)^{-3}$$

$$(79) \ \left(\frac{7}{11}\right)^{-1}$$

$$(56) \ 11^{-2}$$

$$(59) \ 729^{-1/3}$$

$$(62) \ \left(\frac{8}{125}\right)^{2/3}$$

$$(65) \ 16^{-1/4}$$

$$(68) \ 4(8)^{-2/3}$$

$$(71) \ \left(\left(\frac{2}{3}\right)^{2/3}\right)^6$$

$$(74) \ 4^{-5/2}$$

$$(77) \ \left(-\left(\frac{2}{3}\right)\right)^{-3}$$

$$(80) \ 49^{-1/2}$$

$$(57) \ 81^{-3/2}$$

$$(60) \ 3^{-2} + 2^{-3}$$

$$(63) \ \left(\frac{1}{27}\right)^{-2/3}$$

$$(66) \ (10^8)^{3/2}$$

$$(69) \ (-1)^{1/2}$$

$$(72) \ \left(\frac{216}{729}\right)^{2/3}$$

$$(75) \ 125^{2/3}$$

$$(78) \ \left(-\left(\frac{2}{3}\right)\right)^{-2}$$

$$(81) \ 1000^{-2/3}$$

25